IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF	: Kenji Todori et al.
SERIAL NUMBER	: 09/819,621
FOR	: OPTICAL DISK HAVING SUPER-RESOLUTION FILM
FILED	: March 29, 2001
GROUP ART UNIT	1756
EXAMINER	. Angebranndt, Martin J.

DECLARATION UNDER 37 C.F.R. 1.132

Assistant Commissioner for patents
Washington, D.C. 20231

Sir:

I, Kenji Todori, a co-applicant of the above-identified application, a national of Japan, declare as follows:

Sample 2A of Table 2 is compared with Samples 2B, 2C and 2D of Table 2.

Although it is clear that the absorption saturation characteristics (transmittance T under the power density of 1MW/cm^2) of Sample 2A is superior to those of Samples 2B and 2D, it is equal to that of Sample 2C. However, the wavelength of light used for measurement of Sample 2A is different from that of Sample 2C. Therefore, Samples 2A and 2C are different in the effect as follows.

Equation (I) on page 30 of the specification is referred to.

$$\chi^{(3)} = \frac{-N\mu^4}{\omega - \omega_0 + i\Gamma}\left[\frac{2\Gamma}{\gamma}\frac{1}{(\omega_0 - \omega)^2 + \Gamma^2} + \frac{2}{i\gamma}\left(\frac{1}{\omega_0 - \omega_1 - i\Gamma} + \frac{-1}{\omega_0 - \omega_1 + i\Gamma}\right)\right] \quad \ldots (I)$$

The absorption saturation phenomenon has a positive correlation with the third-order nonlinear optical constant $\chi^{(3)}$. The energy relaxation constant γ in the Equation (I) can be regarded as being the same as the transition probability A_{ab} (Einstein's A coefficient) of spontaneous emission.

The transition probability A_{ab} is represented by the following equation.

$$A_{ab} = \frac{2\pi}{\hbar^2}\frac{\hbar}{2\varepsilon_0 V}\frac{V}{\pi^3 c^3}\int d\omega_\lambda \frac{\omega_\lambda{}^2}{\omega_\lambda}\omega_{ba}{}^2\frac{1}{3}|P_{ab}|^2\delta(\omega_\lambda - \omega_{ba}) = \frac{\omega_{ba}{}^3}{3\pi_0 \varepsilon_0 \hbar c^3}|P_{ab}|^2$$

This equation shows that the transition probability A_{ab} is in proportion to the cube of the angular frequency of the laser light ω_{ba}.

FIG. A attached hereto illustrates the relationship between the wavelength λ and $\omega_{ba}{}^3$. As shown in FIG. A, $\omega_{ba}{}^3$ steeply changes in the short-wavelength region. Specifically, $\omega_{ba}{}^3$ at the wavelength of 405 nm (Sample 2A) is 10 % greater than $\omega_{ba}{}^3$ at the wavelength of 418 nm (Sample 2C). This means that A_{ab} of Sample 2A is about 10 % greater than A_{ab} of Sample 2C. That is, an absorption saturation life of Sample 2A is about 10 % shorter than that of Sample C. The difference of about 10% is too large to neglect. As described above, Sample 2A uses light of a wavelength shorter than that of Sample 2C and has an absorption saturation life about 10 % shorter than that of Sample C. Generally, the transmittance of 2A should become smaller than that of 2C. However, Sample 2A has the same high transmittance of 16% as Sample 2C at $1 MW/cm^2$. This high transmittance results from the fact that Sample 2A uses CdSe particles including an AMEO group covalently bonded thereto.

Next, Sample 2E of Table 2 is compared with Samples 2A and 2B of Table 2.

Sample 2E also uses CdSe particles including an AMEO group covalently bonded thereto. However, since R_{mod}/D_{Bohr} of Sample 2E is less than 0.25, Sample 2E has absorption saturation characteristics inferior to that of Sample 2A. In the meantime, the absorption saturation characteristics of Sample 2E is slightly superior to that of Sample 2B having similar R_{mod}/D_{Bohr} under the same wavelength λ, which proves the effect caused by CdSe particles including an AMEO group covalently bonded thereto.

I, the undersigned, declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Date April 23, 2004

Kenji Todori

Kenji Todori

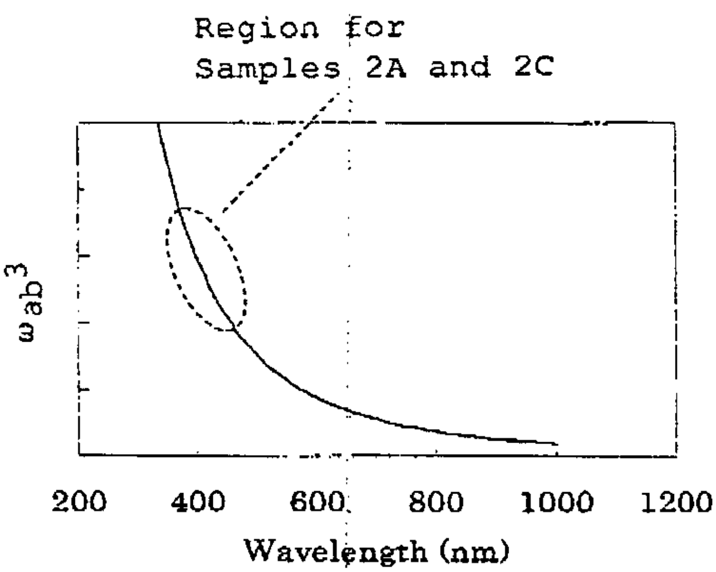
Region for
Samples 2A and 2C
ω_{ab}^3
200
400
600
800
1000
1200
Wavelength (nm)

FIG. A

Table 2

Sample	Super-resolution film						Absorption saturation characteristics		
	Semiconductor particles				M	λ_{max}	λ	T	
	S	R	D_{mod}	D_{mod}/D_{Bohr}				100kW/cm^2	1MW/cm^2
2A	CdSe	AMEO	1.6nm	0.3	AMEO polymer	405nm	405nm	10%	16%
2B	$CdS_{0.1}Se_{0.9}$	-	1.0nm	0.21	PMMA	400nm	400nm	10%	13%
2C	$CdS_{0.1}Se_{0.9}$	-	1.3nm	0.28	PMMA	418nm	418nm	10%	16%
2D	CdSe	-	6.5nm	1.32	PMMA	640nm	640nm	10%	13%
2E	CdSe	AMEO	1.0nm	0.20	PMMA	400nm	400nm	10%	14%
2F	$CdS_{0.6}Se_{0.4}$	-	0.85nm	0.24	SiO_2	405nm	405nm	no change	

D_{mod}/D_{Bohr} represents a ratio of modal diameter D_{mod} of semiconductor particles to Bohr radius D_{Bohr} of the semiconductor.